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CASE REPORT

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Successful percutaneous retrieval of a micra transcatheter pacing system at 8 weeks after implantation

Masatsugu Nozoe MD, PhD | Daisuke Yoshida MD | Daisuke Nagatomo MD | Nobuhiro Suematsu MD, PhD | Toru Kubota MD, PhD | Masanori Okabe MD, PhD | Yusuke Yamamoto MD, PhD

Division of Cardiology, Cardiovascular and Aortic Center, Saiseikai Fukuoka General Hospital, Fukuoka, Japan

Correspondence
Masatsugu Nozoe, Division of Cardiology, Cardiovascular and Aortic Center, Saiseikai Fukuoka General Hospital, Fukuoka, Japan.
Email: nozoe15@gmail.com

Abstract

An 86-year-old woman suffering from repeated methicillin-resistant *Staphylococcus aureus* (MRSA) bacteremia underwent percutaneous lead extraction using an excimer laser. Since negative blood cultures were confirmed three times after lead extraction under intravenous infusion of anti-MRSA drugs, a Micra transcatheter pacing system (Micra TPS) was implanted 7 days after the lead extraction. Although infusion of anti-MRSA drugs was continued for 5 weeks, MRSA was isolated in four separate samples of blood cultures 3 weeks after the discontinuation of the anti-MRSA therapy. The micra TPS was successfully retrieved using a steerable sheath and snare at 8 weeks after implantation.

KEYWORDS
device infection, lead extraction, leadless pacemaker retrieval, micra transcatheter pacing system

1 | INTRODUCTION

While a number of reports on the Micra transcatheter pacing system (Micra TPS, Medtronic, Minneapolis, MN, USA) implantation have been published, we have only limited data regarding the retrieval of the Micra TPS.

2 | CASE REPORT

An 86-year-old woman with renal insufficiency had been receiving long-term oral corticosteroid therapy (prednisolone 6-15 mg/d) for 3 years because of Adult Still's disease. Two years previously, she underwent dual chamber pacemaker implantation (Biotronik, Berlin, Germany) due to tachycardia-bradycardia syndrome associated with paroxysmal atrial fibrillation.

She developed sustained methicillin-resistant *Staphylococcus aureus* (MRSA) bacteremia and septic shock. Because computed tomography (CT) revealed iliopsoas muscle abscess, percutaneous drainage of iliopsoas muscle abscess was performed. Repeated drainage and intravenous infusion of anti-MRSA drugs for 6 weeks led to remission of the MRSA infections.

Ten months after her discharge, MRSA bacteremia recurred. Blood cultures repeatedly detected MRSA; however, CT denied recurrence of the iliopsoas muscle abscess. She was diagnosed with a pacemaker infection and referred to our hospital for percutaneous lead extraction. Under local anesthesia with intracardiac echo monitoring (ViewFlex; St. Jude Medical, Minnetonka, MN, USA) and continuous blood pressure monitoring, we successfully extracted two active fixation leads (atrial lead: Biotronik Solia S53, ventricular lead: Biotronik Solia S60; Biotronik) using an excimer laser. MRSA was also detected at the tips of the extracted leads. We continued the intravenous infusion of antibiotics and confirmed negative blood cultures three times after lead extraction. Seven days after lead extraction, we implanted a Micra TPS into the right ventricular septum via the right femoral vein. The pacing threshold was 0.38 V/0.24 ms,

and the R wave amplitude was 17.7 mV. The Micra TPS was set at 50 bpm as its lower rate. We continued the antibiotics for 5 weeks.

Three weeks after the discontinuation of the anti-MRSA therapy, she was referred to our hospital due to chest discomfort and dyspnea. Although she did not have a fever, MRSA was repeatedly isolated in four separate blood cultures. We immediately re-started the intravenous infusion of anti-MRSA drugs. CT revealed no worsening of the iliopsoas muscle abscesses, and we failed to detect any vegetation by trans-esophageal echography. Because the patient was a compromised host for MRSA, there was a high possibility of repeated MRSA infection. Furthermore, she had few choices of anti-MRSA drugs because of drug allergy. As she was not completely dependent on the pacemaker, the pacing rate of the Micra TPS was about 15%, with a backup pacing rate of 50 bpm. We therefore decided to retrieve the Micra TPS percutaneously. At that time, it had been 8 weeks since the Micra TPS implantation.

The right femoral vein was punctured, and a 23-French Micra introducer sheath (Medtronic) was advanced to the right atrium, followed by an 8.5-French Agilis NxT large-curl steerable sheath (St. Jude Medical) within it. A deflectable Agilis sheath was used to advance a 5.5-French Lassos snare (Osypka, Berlin, Germany) into the right ventricle. A coaxial position was confirmed with bi-plane fluoroscopy, and the Lassos snare entrap the retrieval feature at the proximal end of the Micra TPS (Figure 1). With constant traction, the Micra TPS was successfully retracted from the myocardium. After the Micra TPS was drawn within the Micra introducer sheath, it was removed from the heart. The total duration of the procedure from puncture to closure was 25 minutes, and the fluoroscopy time was 6.1 min. There were neither adhesions nor capsules around the retrieved Micra TPS (Figure 2). Cultures of the retrieved Micra TPS were negative for MRSA.

Several days after the Micra TPS retrieval, lumbar magnetic resonance imaging (MRI) detected pyogenic spondylitis. Percutaneous drainage for pyogenic spondylitis was performed, and the MRSA infections were ultimately controlled with the continuation of anti-MRSA drugs.

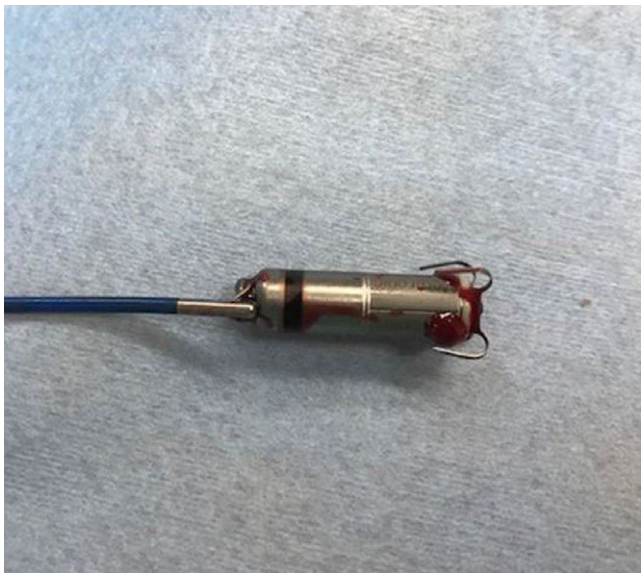

FIGURE 2 There were neither adhesions nor capsules around the retrieved Micra TPS

Because the cultures of the extracted Micra TPS were negative, we now consider there to have been no definite Micra TPS infection.

3 | DISCUSSION

Limited data are available regarding the retrieval of a chronically implanted Micra TPS. We herein report a valuable case of the successful percutaneous retrieval of a Micra TPS at 8 weeks after implantation.

Full encapsulation of the Micra TPS has been observed, and this may make it difficult to recapture the proximal retrieval feature of the device. Early pre-clinical animal experience demonstrated the unsuccessful retrieval in one out of four sheep up to 28 months after the Micra TPS implantation due to full encapsulation of the

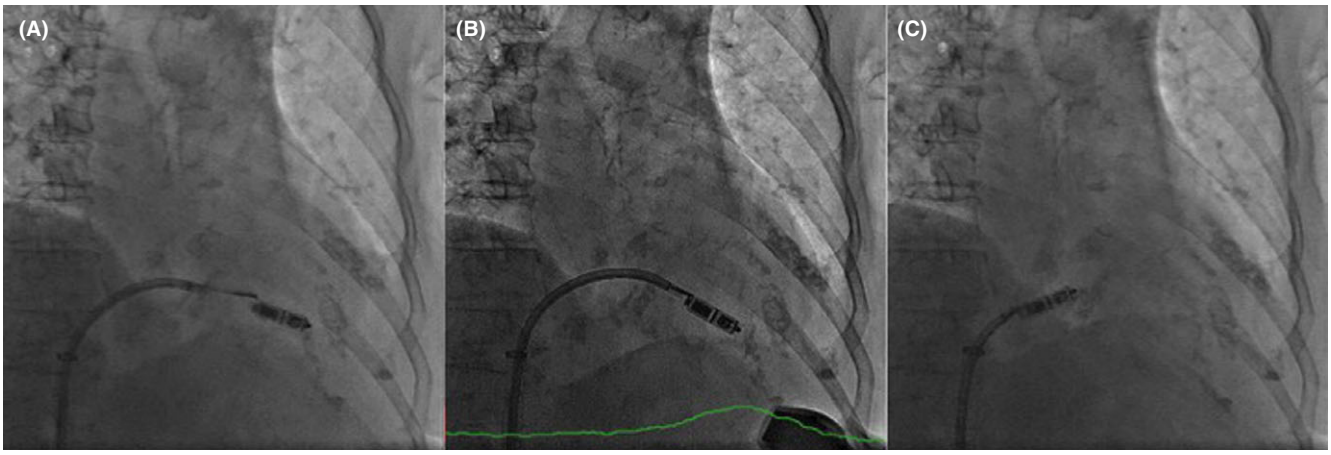

FIGURE 1 A, A Lassos snare supported by a deflectable Agilis sheath entrap the retrieval feature at the proximal end of the Micra TPS. B, With constant traction, we successfully retracted the Micra TPS from the myocardium. C, The captured device was subsequently withdrawn via the Micra introducer sheath

device.[1] An autopsy at 1 year after implantation revealed that the Micra TPS was completely covered with fibrous tissue.[2] The successful extraction of the Micra TPS in human patients 3 weeks and 1 month after the initial device implantation were reported. It was also reported that 13 patients who underwent Micra TPS implantation required system revision. In eight of 10 patients, the attempt at retrieval was successful. Regarding the unsuccessful attempts, the Micra TPS had been present in situ for 229 and 259 days.[3] In our case, the Micra TPS was easily detached from the right ventricular wall at 8 weeks after implantation, and there were no adhesions around the extracted Micra TPS.

As iliopsoas muscle abscesses sometimes co-exist with pyogenic spondylitis, we should have considered pyogenic spondylitis as a potential source of MRSA bacteremia before the implantation of a Micra TPS. However, since CT denied the recurrence of iliopsoas muscle abscess at the time of referral to our hospital, we considered the pacemaker infection to be the sole source of bacteremia and failed to perform lumbar MRI to exclude pyogenic spondylitis. Furthermore, because the patient had received temporary pacing with an external pacer after lead extraction, we were unable to perform lumbar MRI before Micra TPS implantation.

We implanted the Micra TPS 7 days after lead extraction with the confirmation of negative blood cultures three times, according to the 2017 HRS expert consensus statement on cardiovascular implantable electronic device (CIED) lead management and extraction.[4] However, if we had noticed the presence of iliopsoas muscle abscess at the time of lead extraction, implantation might have been postponed until the iliopsoas muscle abscess was controlled.

We decided to retrieve the Micra TPS after weighing the risk of repeated bacteremia against the need for pacing. While the patient had undergone pacemaker implantation due to tachycardia-bradycardia syndrome associated with paroxysmal atrial fibrillation 2 years earlier, she was not completely dependent on a pacemaker at this time. Her heart rate was about 40 bpm in sinus rhythm in the absence of pacing support, and episodes of paroxysmal atrial fibrillation were observed infrequently. Furthermore, the risk of syncope was low for the time being, even if post-conversion pauses occurred, as she was confined to bed for the treatment of pyogenic spondylitis with percutaneous drainage. Therefore, we decided to retrieve the Micra TPS to control the bacteremia. As the 2017 HRS expert consensus statement on CIED lead management and extraction [4] advocates, we would like to emphasize that the reassessment of the need for a new CIED is imperative after removal of an infected CIED.

Further data are needed to evaluate the safety and efficacy of retrieving chronically implanted Micra TPS.

CONFLICT OF INTERESTS

Authors declare no conflict of interests for this article.

ORCID

Masatsugu Nozoe http://orcid.org/0000-0002-8450-573X
Toru Kubota http://orcid.org/0000-0001-6892-8639

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